

## MARINA 4 CYLINDER

GENERAL SPECIFICATIONS										
Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1974	109.7	1798	1-Bbl.	....	100@2500	8.0-1	3.16	80.26	3.5	89

### ENGINE IDENTIFICATION

Engine number is stamped on cylinder block or metal plate attached to right side of engine.

Year ..... Engine Code  
 1974..... 18V

### ENGINE REMOVAL

1) Disconnect battery, drain and remove radiator, remove air cleaner and hoses. Disconnect, separate and/or remove the following: fuel inlet line, breather line, vapor return hose, carburetor, and brake servo.

2) Disconnect electrical harness at alternator, oil pressure switch, thermal transmitter, distributor, ignition coil and starter. Disconnect water hoses and move out-of-way.

3) Attach a suitable hoist to engine. Disconnect starter electrical wires and remove starter. Disconnect exhaust system from manifold and move out-of-way. Place a jack under transmission. Remove transmission mounting bolts. Remove engine mounts and pull engine forward until free from transmission input shaft; lift from vehicle.

### INTAKE & EXHAUST MANIFOLD

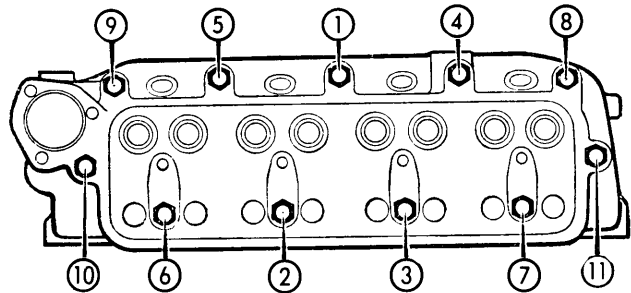
Remove air cleaner, carburetor and disconnect distributor vacuum line. Remove six exhaust pipe-to-manifold clamp bolts and lock washers. Remove manifolds. Four nuts in center have large washers which hold both intake and exhaust manifolds. Two remaining nuts (one at each end of manifolds) have small washers and hold exhaust manifold only.

### CYLINDER HEAD

1) Drain cooling system and remove top radiator hose. Remove air cleaner, carburetor and exhaust and intake manifolds. Remove rocker assembly and head bolts.

2) Disconnect spark plug wires and plugs. Disconnect heater hose and heater control cable from water valve. Remove water temperature sensor from front of cylinder head and release conductor from its support clamp.

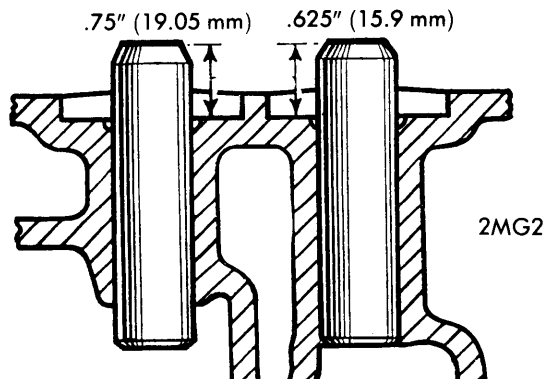
3) Loosen clamps and disconnect hoses from water pipe on left side of cylinder head. Remove pipe. Remove distributor vacuum line from rear cylinder head stud and remove cylinder head. To install, reverse removal procedure using tightening sequence shown.



2MG1

← FRONT  
CYLINDER HEAD TIGHTENING SEQUENCE

VALVES							
Engine & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
1798 cc Int.	1.625 (41.28)	45°	45°	.130 (3.302)	.3422-.3427 (8.692-8.705)	.002-.003 (.051-.076)	.360 (9.144)
Exh.	1.343 (34.11)	45°	45°	.130 (3.302)	.3417-.3422 (8.678-8.692)	.002-.003 (.051-.076)	.360 (9.144)



VALVE GUIDE INSTALLATION

### VALVE ARRANGEMENT

E-I-I-E-E-I-I-E (front to rear).

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1798 cc	1.92 (48.77)	82@1.44 (37.2@36.58)	142@1.08 (64.4@7.4)

### VALVE SPRINGS

With cylinder head removed, compress springs using suitable tool (18G 45). Remove valve keepers and release spring com-

## MARINA 4 CYLINDER (Cont.)

pressor. Remove valve collar, springs and "O" ring oil seal. To install, reverse removal procedure. Soak "O" rings in clean engine oil for a short time before installation.

### VALVE GUIDE SERVICING

Using suitable drift, press worn valve guides downward into combustion chamber. Press new guides in from top of cylinder head until top of valve guide is .75" (Intake) or .625" (Exhaust) from machined face of valve spring seat recess.

### ROCKER ARM ASSEMBLY

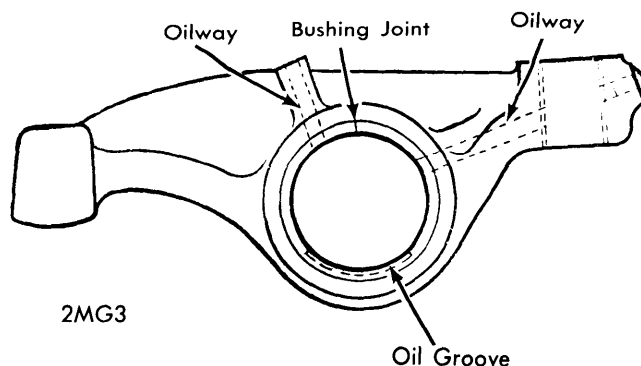
1) Drain cooling system and disconnect breather pipe from rocker cover (if equipped). Remove throttle cable and rocker cover. Remove rocker shaft bracket nuts gradually, one turn at a time, until all load has been released. Notice that under right rear rocker stud nut there is a lock plate.

2) Remove all rocker shaft bracket nuts and rocker assembly. Remove set screw which locates rocker shaft in rear rocker bracket. Remove cotter pins, flat washers and spring washers from each end of shaft. Slide rockers, brackets and springs off of shaft.

3) Using suitable tools (18G 226 and 18G 226 A), place rocker on anvil and drive out worn bushing. Place new bushing on driver and position bushing with butt joint at top of rocker bore and oil groove at bottom of rocker bore. Drive bushing into rocker arm.

4) It is necessary to drill oil holes in bushing to coincide with oilways in rocker arm. Holes may be drilled either before or after installation. If holes are drilled after installation, remove adjuster screw and use a .093" drill to drill out end plug and to continue oilway through bushing. Replug end after drilling using a rivet, weld rivet in position. Oil hole in top of rocker barrel is drilled with a No. 47 (.0785") drill. After drilling is complete, burnish ream bushing to .6225-.6260".

5) To reassemble, reverse disassembly procedure and replace rockers and springs in their original positions. Remember to replace rocker shaft locating screw lock plate.



ROCKER ARM ASSEMBLY

### MECHANICAL VALVE LIFTER ASSEMBLY

Drain cooling system and remove rocker shaft assembly. Withdraw push rods, keeping them in their original order. Disconnect hose from oil separator. Remove bolts attaching heater pipe clamp to bracket on side covers. Remove bolts, washers, seals and side covers. Withdraw lifters, keeping them in their installed order. To install, reverse removal procedure.

### VALVE CLEARANCE ADJUSTMENT

Remove valve cover and observe opening and closing of valves. To check clearances, turn crankshaft until valves in first column are fully open, then valve in second column may be checked and adjusted to .013". Set clearances with engine cold.

Valves Open	Valves to Adjust
1.....	8.....
3.....	6.....
5.....	4.....
2.....	7.....
8.....	1.....
6.....	3.....
4.....	5.....
7.....	2.....

PISTONS, PINS, RINGS						
Engine	PISTONS Clearance In. (mm)	PINS		RINGS		
		Piston Fit In. (mm)	Rod Fit In. (mm)	Rings	End Gap In. (mm)	Side Clearance In. (mm)
1798 cc	① .0021-.0037 (.053-.094)	③	Press Fit	No. 1	.012-.022 (.305-.556)	.0015-.0035 (.038-.089)
	No. 2			.012-.022 (.305-.556)	.0015-.0035 (.038-.089)	
	Oil			.015-.045 (.381-1.14)	.0016-.0036 (.041-.091)	
	② .0006-.0016 (.015-.041)					

① - Top. ② - Bottom. ③ - Hand Push Fit at 60°F (15.6°C).

### OIL PAN

Drain oil pan and remove bolts connecting pan to flywheel housing. Remove oil pan bolts and withdraw oil pan. To install, reverse removal procedure.

### PISTON & ROD ASSEMBLY

1) With cylinder head and oil pan removed, unscrew rod bolts and push piston and rod assembly out top of cylinder.

Replace rod cap on rod so assembly will remain mated for correct reassembly. Rod assemblies must return to original bearing journal and position.

2) With offset of connecting rods facing correctly, install pistons with mark "►" or word "FRONT" facing forward. Install bearing inserts and lubricate with graphite oil (Acheson's Colloids "Oildag"). Install rod caps and tighten rod bolts.

## MARINA 4 CYLINDER (Cont.)

## FITTING PISTONS

1) When installing pistons and rings, check ring end gaps and side clearances. Place oil control bottom rail below bottom piston ring groove. Install oil control expander into bottom ring groove. Move bottom rail into bottom ring groove. Install top rail in top of groove. Check that ends of expander are butting, but not overlapping. Set gaps of rails and expander at 90° to each other.

2) Install second compression ring on piston with marking "TOP" facing upward. Place thinner plain compression ring in top piston ring groove. Space end gaps at 90° to each other and away from thrust face of piston.

## PISTON PINS

1) Using suitable tool (18G 1150), press piston pin out of piston.

*NOTE* — When using tool No. 18G 1150, it is essential that face marked "FRONT" or "►" is placed against adaptor face. Piston pin is offset toward camshaft side of engine, therefore piston must face correctly with "FRONT" of piston facing forward.

2) Install new piston pin on tool and pull pin into correct position in piston. A minimum of 12 ft. lbs. of torque is necessary for proper pin fit using tool No. 18G 1150. Lubricate piston pin and check for freedom of movement in piston.

## CRANKSHAFT MAIN &amp; CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS			CONNECTING ROD BEARINGS			
	Journal Diam. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
1798 cc	2.1265-2.1270 (54.013-54.026)	.001-.0027 (.025-.069)	Center	.002-.003 (.051-.076)	1.8759-1.8764 (47.648-47.661)	.0015-.0032 (.038-.081)	.008-.012 (.203-.305)

## MAIN &amp; CONNECTING ROD BEARINGS

Mark main and connecting rod caps for reinstallation. On connecting rods, bend down locking strips so that bolts may be removed. Measure bearing journals and determine bearing clearances. Replace inserts as necessary. Rear main bearing cap horizontal joint surface should be lightly coated with suitable sealing compound. Replace sealing corks of number one and five main bearing caps. Soak sealing corks in oil before installing. Check crankshaft end play.

## THRUST BEARING ALIGNMENT

A thrust washer is fitted on each side of center main bearing to take crankshaft end thrust. Washers each consists of two semi-circular halves, one having a lug located in recess in bearing cap. Washers are available in standard and .003" oversize. Determine necessary combination of washers to achieve proper crankshaft end play. Replace center main bearing cap and tighten cap bolts.

## REAR MAIN BEARING OIL SEAL

Remove transmission, clutch and flywheel. Remove transmission adaptor plate and press oil seal out of plate. Lubricate new oil seal and press into adaptor plate until lip of seal is flush with front face of transmission adaptor plate. Reverse removal procedure for remaining components.

## ENGINE FRONT COVER

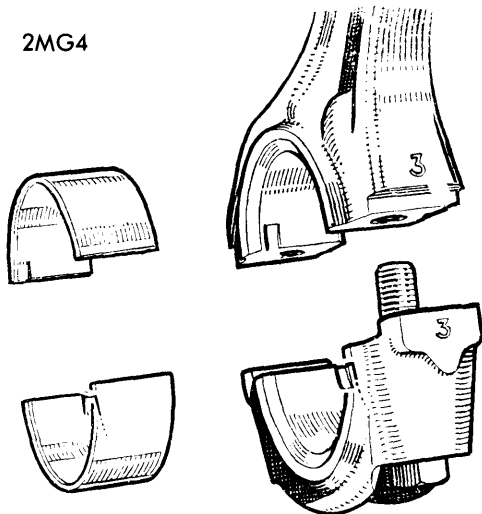
1) Drain cooling system and remove radiator. Loosen alternator mounting bolts and remove fan belt. Remove crankshaft pulley and timing cover.

2) To install, use a new gasket and reverse removal procedure. Oil seal in timing cover should be renewed if necessary. Make sure that oil thrower behind crankshaft pulley is attached with face marked "F" away from engine.

## FRONT COVER OIL SEAL

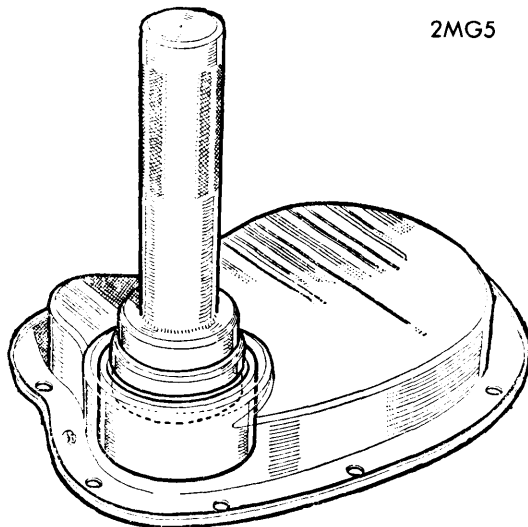
Fill annular groove between lips with grease. Lubricate hub of pulley and push it into seal. At same time turn it to avoid damage to lips of seal. Slide pulley onto shaft with keyway in line with key in crankshaft. Turn cover as necessary to align set screw holes with those in crankcase. Do not strain cover against flexibility of seal. Insert and tighten set screws, replace and tighten pulley attaching bolt.

2MG4



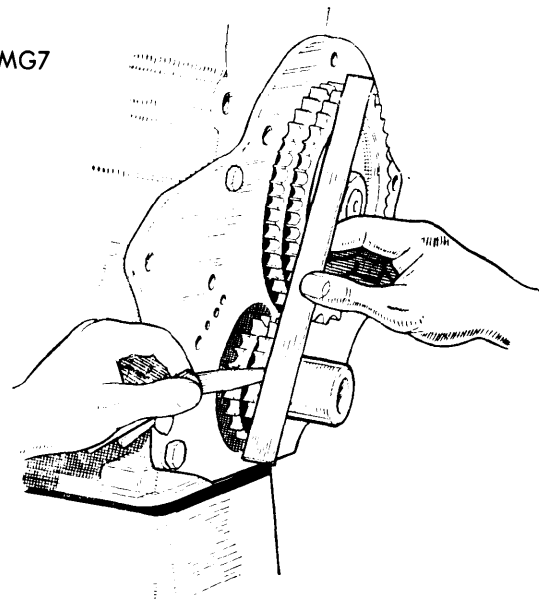
## ROD BEARINGS

## MARINA 4 CYLINDER (Cont.)



2MG5

FRONT OIL SEAL REPLACEMENT



2MG7

TIMING SPROCKET ALIGNMENT

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1798 cc Front	1.7887-1.7892 (45.433-45.446)	.001-.002 (.025-.051)	.....
Center	1.7287-1.7292 (43.909-43.921)		
Rear	1.6227-1.6232 (41.217-41.230)		

### CAMSHAFT

1) Disconnect battery and remove intake and exhaust manifolds. Drain cooling system and remove radiator. Remove rocker arm assembly, push rods and tappets. Remove timing cover, timing chain and sprockets.

2) Disconnect distributor vacuum line at distributor and remove distributor hold-down bolts. Do not loosen clamping plate bolt or ignition timing will be disturbed. Remove distributor assembly.

3) Remove license plate and grille. Remove engine mounts and lower engine until camshaft aligns with grille opening. Remove three set screws and lock washers that hold camshaft locating plate to cylinder block. Remove camshaft.

### TIMING CHAIN

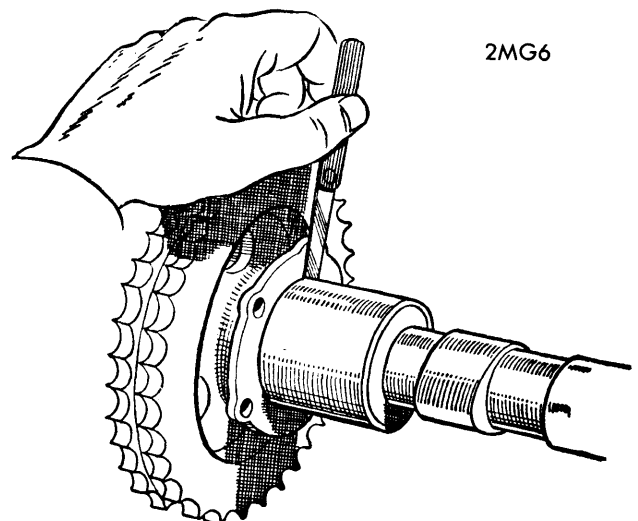
1) Drain cooling system, remove radiator, crankshaft pulley and timing chain cover. Remove bottom plug from chain tensioner, insert 1/8" Allen wrench into cylinder, and turn key clockwise until rubber slipper head is fully retracted and locked behind peg limit.

2) Remove screws and tensioner along with its backplate. Unlock and remove camshaft sprocket nut and lock washer. Ease camshaft and crankshaft sprockets forward, a fraction at a time with suitable small levers, and remove sprockets.

*NOTE - Use care not to lose spacer washers behind crankshaft sprocket. Make sure to replace same number of washers as removed. To determine correct thickness of washers to be used if new camshaft or crankshaft sprockets have been installed, place straight edge across sides of camshaft sprocket teeth. Measure gap between straight edge and crankshaft sprocket. Subtract .005" from reading and install resulting thickness of crankshaft spacing washers.*

3) Place crankshaft with keyway at TDC and camshaft with keyway about one o'clock position. Assemble gears into timing chain with two marks on sprockets opposite each other.

4) Keep sprockets in this position, engage crankshaft sprocket keyway, and rotate camshaft sprocket keyway until it is aligned. Push gears onto shafts as far as they will go and tighten nuts. Replace remaining components.



2MG6

CAMSHAFT END PLAY

## MARINA 4 CYLINDER (Cont.)

4) Before reassembly, assemble camshaft retaining plate and sprocket to camshaft and check camshaft end play. End play should be .003-.007". Achieve this measurement by measuring between retaining plate and thrust face of camshaft front bearing journal. If end play is excessive, replace retaining plate.

## CAMSHAFT BEARINGS

**NOTE** — Use a suitable tool assembly to remove, install and ream camshaft bearings. Manufacture recommended tool and adaptors are 18G 124 A, 124 B, 124 C, 124 F, 124 G and 124 H for bearing removal. Tool, cutters, pilots and adaptors are 18G 124 A, 124 B, 124 C, 124 F, 124 H, 123 A, 123 B, 123 E, 123 F, 123 L, 123 T, 123 AB, 123 AC, and 123 AD for installation and reaming of bearings.

**Removal** — 1) With cylinder head, crankshaft, connecting rods, pistons and camshaft removed, install tool 18G 124 A with slotted washer and adaptor 18G 124 F. Remove front camshaft bearing.

2) Remove rear bearing, using tool 18G 124 A with slotted washer and adaptor 124 B.

3) Install adaptor 18G 124 H into front bearing bore. Remove center bearing, using tool 18G 124 A with slotted washer and adaptor 124 C.

**NOTE** — On installation of new bearings, make sure oil holes in bearings align with oil holes in crankcase. Cut-away portion of "C" washer used with tool 18G 124 A must be faced away from butt joint of bearing.

**Installation** — 1) Install new front camshaft bearing, using tool 18G 124 A with large "C" washer, slotted washer and adaptor 18G 124 F.

2) Install new rear bearing, using tool 18G 124 A with large "C" washer, slotted washer and adaptor 18G 124 B.

3) Install adaptor 18G 124 H into front camshaft bearing. Install center bearing, using tool 18G 124 A with large "C" washer and adaptor 18G 124 C.

**CAUTION** — Arbors should be lightly lubricated before assembling cutters and pilots. It is essential that cutters are kept clear of chips while reaming. Feed cutters very slowly and keep cutters dry.

**Reaming** — 1) Insert tapered pilots 18G 123 AB and 18G 123 AC into camshaft center and rear bearings. Place plain pilot 18G 123 L on arbor 18G 123 A, followed by cutter 18G 123 E. Pass arbor through front bearing and center pilot, install cutter 18G 123 B and pass arbor through pilot in rear bearing.

2) Ream front and rear bearings noting: Front bearing will be cut first. Cutter for rear bearing will follow after front bearing has been cut, with arbor piloting in front and center bearings. Clean away all chips before plain pilot enters front bearing.

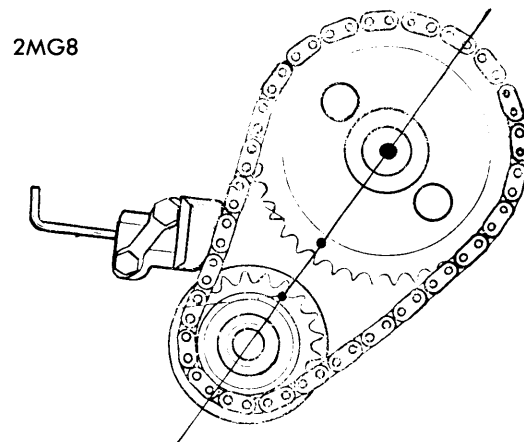
3) Insert pilot 18G 123 T in camshaft front bearing. Insert pilot 18G 123 AD in rear bearing. Pass arbor 18G 123 A

through front bearing pilot, slide cutter 18G 123 F onto arbor, and pass arbor through pilot in rear bearing. Ream center bearing. Thoroughly clean all chips from engine block.

VALVE TIMING				
Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
1798 cc	16°	56°	51°	21°

## VALVE TIMING

Rotate engine until keyway on crankshaft is at TDC. Timing marks on crankshaft and camshaft sprockets should be aligned. If marks are not aligned, rotate crankshaft one complete revolution and check again. If marks are still not aligned camshaft timing is incorrect, See *Timing Chain*.



## TIMING MARKS

## ENGINE OILING

**Crankcase Capacity** — 7.75 pts. including filter.

**Oil Filter** — Full Flow with disposable cartridge.

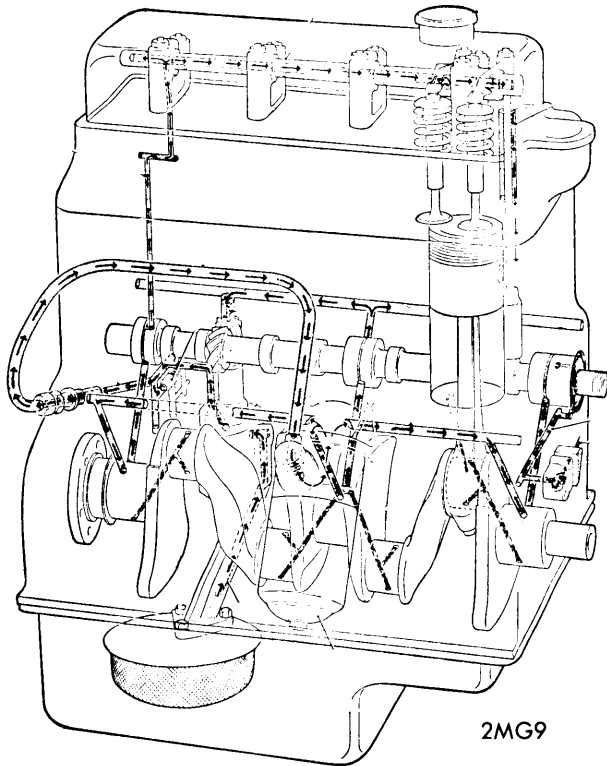
**Normal Oil Pressure** — Over 70 psi at road speed and over 25 psi at engine idle.

**Relief Valve** — Located at rear of left side of cylinder block, pressure relief set at 70 psi.

## ENGINE OILING SYSTEM

Force feed system with rotor type oil pump. A full-flow type oil filter is used. An oil pressure relief valve is used to enable oil to by-pass filter if oil filter becomes blocked.

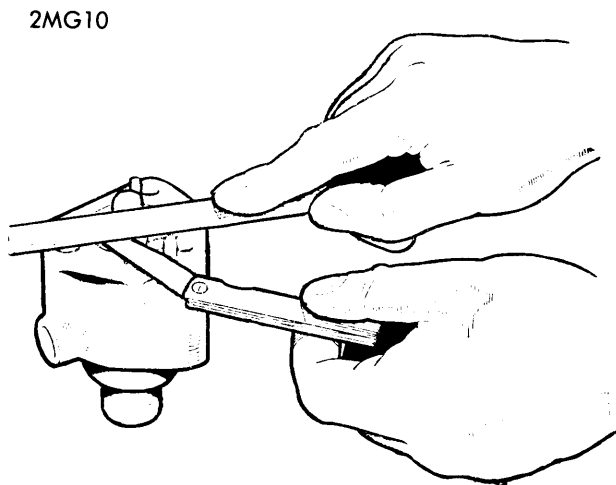
## MARINA 4 CYLINDER (Cont.) ENGINE OILING (Cont.)



2MG9  
ENGINE OILING SYSTEM

### OIL PUMP

1) Two bolts retain oil pump cover and three studs hold pump to crankcase. Remove attaching nuts and withdraw pump and drive shaft. Remove cover, located at base of oil pump by two dowels. Remove outer rotor complete with oil pump shaft. Clean all parts and inspect for wear.

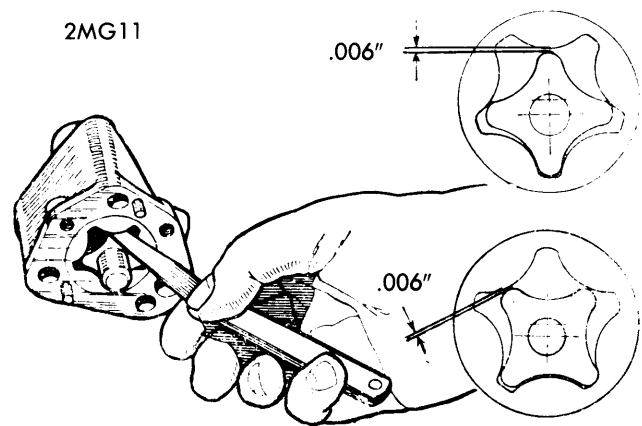


2MG10  
OIL PUMP ROTOR END PLAY

2) Install rotors in pump body and place straightedge across joint face of pump body. Measure clearance between top face of rotors and underside of straightedge. Clearance should not exceed .005". If clearance is excessive, replace oil pump assembly.

3) Check clearance between outer rotor and rotor pocket in pump body. If clearance exceeds .010", pump rotor, pump body or complete pump assembly should be replaced.

4) Measure clearance of rotor lobes with rotors installed in pump body. If clearance exceeds .006", rotors must be replaced.



2MG11  
OIL PUMP ROTOR LOBE CLEARANCE

5) Reassemble pump and lubricate all parts with clean engine oil. Make sure outer rotor is installed in pump body with chamfered end at drive end of rotor pocket in pump body.

### ENGINE COOLING

Cooling System Capacity - 10.75 pts. with heater.

Thermostat - 180°F standard, 190°F cold climate, 165°F hot climate.

Pressure cap - 15 psi.

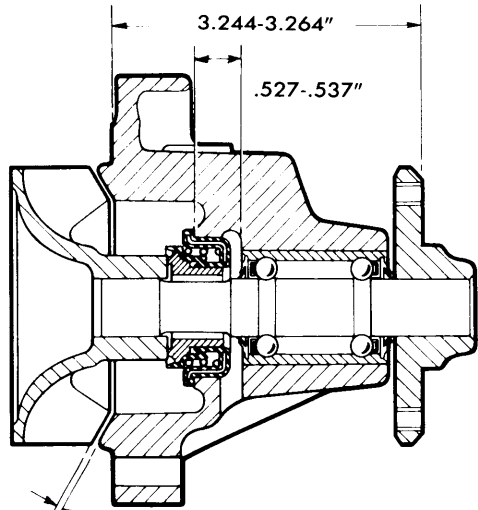
### WATER PUMP

1) Drain cooling system, remove top and bottom radiator hoses. If oil cooler is installed, disconnect oil cooler lines from both cooler and engine. Remove water pump attaching bolts and pump.

2) Press bearing shaft out of pulley hub. Support pump body and press out bearing assembly complete with impeller seal. Press bearing shaft from impeller. Remove water seal from bearing shaft.

3) Replace all components which are worn or damaged. Press bearing assembly into pump body. Support bearing shaft and press pulley hub onto shaft. Install water seal in pump body, support bearing shaft and press impeller onto shaft until dimensions given in illustration are achieved.

## MARINA 4 CYLINDER (Cont.)



3AS1  
**WATER PUMP ASSEMBLY DIMENSIONS**

### TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Main Bearing Caps.....	70 (9.7)
Flywheel Bolts.....	40 (5.5)
Connecting Rod Caps.....	33 (4.6)
Cylinder Head Nuts.....	45-50 (6.2-6.9)
Rocker Brackets.....	25 (3.5)
Oil Pump-to-Crankcase.....	14 (1.9)
Oil Pan.....	6 (.83)
Side Cover.....	3-4 (.41-.55)
Timing Cover	
1/4" Screws.....	6 (.83)
5/16" Screws.....	14 (1.9)
Water Pump.....	17 (2.4)
Thermostat Housing.....	8 (1.1)
Rocker Cover Nuts.....	4 (.55)
Manifold Nuts.....	15 (2.1)
Crankcase Pulley.....	70-80 (9.7-11.1)
Camshaft Sprocket.....	60-70 (8.3-9.7)